



Academic Session: 2021-2022

PHY 2207: Semiconductor Physics

3 Hours/week

3 Credits

Examination Duration: 3 Hours

- 1. Introduction to Semiconductor:** Metal, Insulator and Semiconductor; Semiconducting Materials; Intrinsic and Extrinsic Semiconductors.
- 2. Theory of Semiconductors:** P-Type and N-Type Materials; Bonding in Si and GaAs Crystals; Electron and hole concentrations; Diffusion of carriers; Characteristics of P-N junction; Bandgap Engineering; Hall Effects for One and Two-carrier Systems.
- 3. Semiconductor Crystal Growth and Doping:** Bulk Crystal Growth of Elemental (Si) and Compound (GaAs) Semiconductors; Epitaxial Material Growth: Molecular Beam Epitaxy (MBE), Mechanism of Carrier Generation by Doping in Elemental and Compound Semiconductors; Wafer Preparation; Fabrication of Integrated Circuits.
- 4. Diodes:** Volt-Ampere Characteristics, Junction Capacitances, Diode Applications: Rectifier and Power Supplies; Ripple factor; Special Diodes: Zener Diodes, Photo Diodes, LED; Weakly and Tightly Bound Excitons; Photoconductivity.
- 5. Transistor:** Fundamentals, Construction and Operation; Transistor DC and AC Characteristics; UJT; SCR; Phototransistor; FET: Construction and Characteristics of JFET and MOSFET.

Books Recommended:

<i>Robert L. Boylestad</i> <i>Louis Nashelsky</i>	Electronic Devices and Circuit Theory
<i>Gary S. May</i> <i>Simon Sze</i>	Fundamentals of Semiconductor Fabrication
<i>Chenming Hu</i>	Modern Semiconductor Devices for Integrated Circuits
<i>Ali Omar</i>	Elementary Solid State Physics
<i>Simon M. Sze</i>	Physics of Semiconductor Devices